

B. CONS.ENGG. 3RD YR 1ST. SUPPLYMENTARY. EXAM.-2017

THEORY OF STRUCTURE – II,

Part – I, Full Marks: 100

Time: Three hours

Answer any Two questions. Assume suitable data not provided

- Analyse the frame by **slope-deflection method** and draw the final bending moment diagram of the frame as shown in Fig.1. The size of beam BC is 250 mm X 350 mm and the side of the square columns AB & DC are 300 mm and 250 mm respectively. $E = 2.5 \times 10^4$ MPa for all the members.

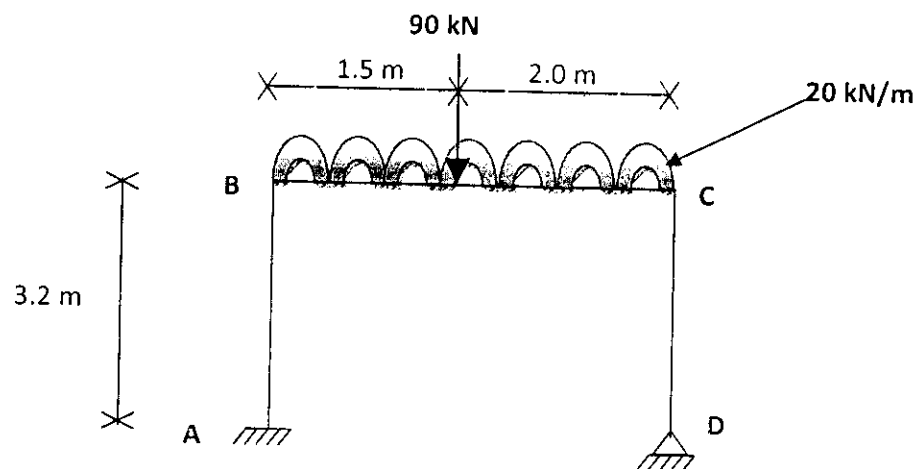


Fig.1: Frame (2D) Problem

- Analyse the continuous beam as shown in Fig.2 by **Moment Distribution Method** and draw the final bending moment and shear force diagram. $E = 2.5 \times 10^4$ MPa. The depth of beams PQ, QR, and RS are 250 mm, 450 mm & 350 mm respectively. The width of all the beams are 250 mm.

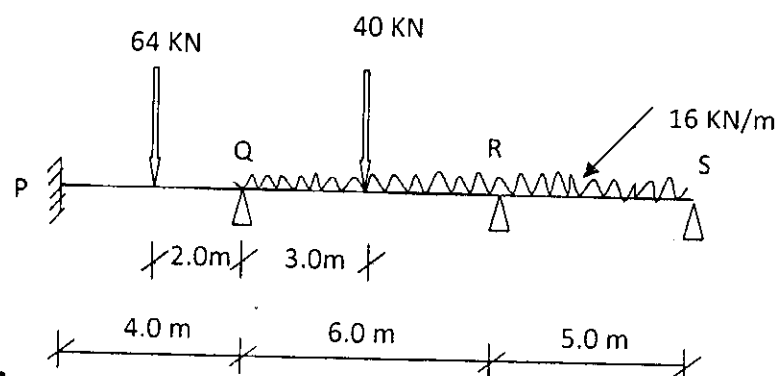


Fig. 2 Continuous Beam Problem

3. Evaluate the horizontal and vertical components of deflection of the free end R of the bracket truss as shown in Fig.3 by **Matrix Method** of analysis. Calculate also the member forces of PR & QR of the same truss. For all the truss members the cross sectional areas are 19 cm^2 ; $E = 2.1 \times 10^5 \text{ MPa}$

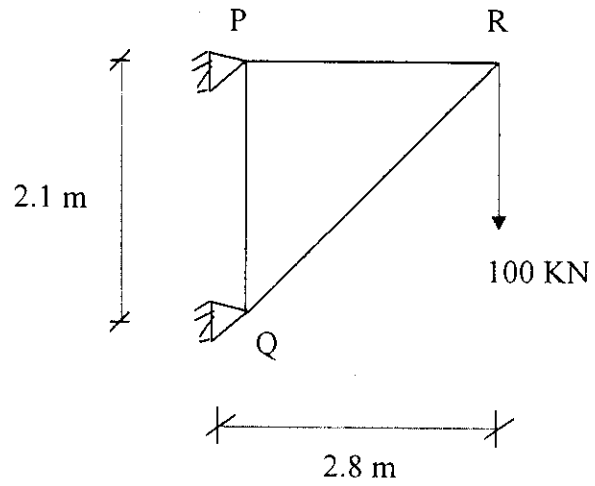


Fig. 3: Truss Problem

B CONS. ENGG 3RD YEAR 1ST SEM SUPPLYMENTARY - 2017

Answer any **TWO** questions.

EX/CON/T/314/2017(S)

THEORY OF STRUCTURES - II

PART - II

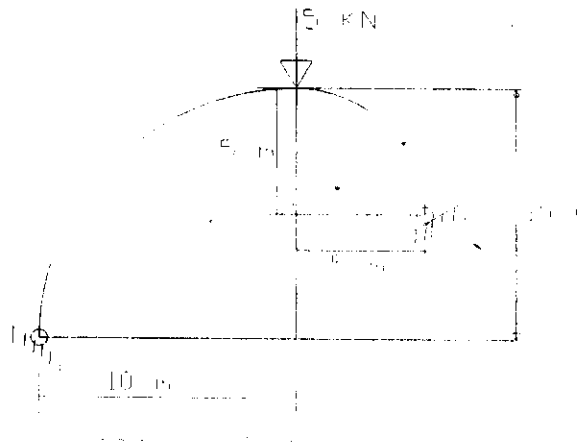
Answer all parts of the same question **SERIALLY** & written together. This should be **STRICTLY ADHERED** to.

Please use a **FRESH** page while answering a **NEW** question or any part of a new question.

- (a) Plot the ordinates of the 'Influence Line Diagram' at 3.0 M intervals for 'Normal Thrust' & 'Shear Force' for a Two Hinged Parabolic Arch of span 21.0 M & crown height 6.0 M

(b) Define the concept 'Influence Line Diagram' 22 + 3 = 25
- (a) A load train consisting of 4 point loads : 4.0, 6.0, 6.0 & 5.5 kN separated by a distance of 1.5, 2.0 & 2.5 M from left to right is approaching a bridge girder spanning 20.0 M & supported on two abutments at the same level from left to right. Determine the Maximum Bending Moment encountered. Plot the Shear Force in this situation.

(b) State & prove 'Maxwell's Reciprocal Theorem' 18 + 7 = 25
- Determine the horizontal thrust 'H' for the frame at the abutments as shown in the drawing below. 25



- Determine from **first principles** that the 'Reaction Locus' of a two hinged semicircular arch is a straight line parallel to the level of the abutments & spaced $HL / 2$, where 'L' is the distance between the abutments. 25